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COLLOIDAL NANOPARTICLES OF VARIABLE DIMENSIONALITY IN OPTICS, HYBRID STRUCTURES AND FUNCTIONAL MATERIALS

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Semiconductor and metal nanoparticles prepared by colloidal chemistry route possess unique optical properties which are strongly affected by their dimensionality. Here, we discuss how physical borders in 0, 1 and 2 D nanoparticles control their electronic structure and through this absorption and emission parameters. CdSe and Ag nanospheres, nanorods and nanoplatelets are among best studied semiconductor and metal nanoparticles of different dimensionality. Going from nanospheres to nanorods and nanoplatelets we vary not only spectral range of absorption and emission, but also spectral linewidth, emission decay time, its polarization and spatial arrangement. Since, our basic objects are colloidal nanoparticles, their surface properties (curvature, type and number of surface ligands) play important role in physical chemical behavior (colloidal stability, inter-particle interaction, etc.). Surface properties further determine possibility to use such colloidal nanoparticles in hybrid structures and functional materials important for practical applications, such as fluorescent biomarkers, QDTV screens, sun light converters. We will discuss basic principles of the surface modification of semiconductor and metal nanoparticles of different dimensionality and how incorporate them into various matrices in order to use them in practice.